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Terms: **patno=4823070** ([Edit Search](#))

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07082989 (07) 4823070 April 18, 1989

UNITED STATES PATENT AND TRADEMARK OFFICE GRANTED PATENT  
**4823070**

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April 18, 1989

Switching voltage regulator circuit

**REISSUE:** December 10, 1996 - Reissue Application filed Dec. 10, 1996 (O.G. Aug. 12, 1997) Ex. Gp.: 2111; Re. S.N. 08/794,374 Reissue Application filed Nov. 16, 1995 (O.G. Mar. 26, 1996) Ex. Gp.: 2111; Re. S. N. 08/558,024 Reissue Application filed Apr. 10, 1991 (O.G. May 21, 1991) Ex. Gp.: 212 August 12, 1997

**INVENTOR:** Nelson, Carl T., San Jose, CA

**APPL-NO:** 07082989 (07)

**FILED-DATE:** August 3, 1987

**GRANTED-DATE:** April 18, 1989

**ASSIGNEE-AT-ISSUE:** Linear Technology Corporation, Milpitas, CA

**LEGAL-REP:** Rogers, Laurence S.

**PUB-TYPE:** April 18, 1989 - Utility Patent having no previously published pre-grant publication (A)

**PUB-COUNTRY:** United States (US)

**REL-DATA:**  
Addition of Ser. No. 932158, November 18, 1986

**US-MAIN-CL:** 323#285

**US-ADDL-CL:** 323#299, 363#021

**SEARCH-FLD:** 363##20 , 363##21 , 363##97 , 363##131 , 323##282 , 323##284 , 323##285 , 323##299 , 323##267

**IPC-MAIN-CL:** G 05F001#563

**PRIM-EXMR:** Salce, Patrick R.

**ASST-EXMR:** Peckman, Kristine

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patno=4823070

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12/10/02

US 4,823,070

07/683549

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Last update of file: 2002/12/05 (YYYY/MM/DD) 2002-48/UP (basic update)

Search statement 1

?us4823070/pn

\*\* SS 1: Results 1

Search statement 2

?prt fu legalall max

1/1 PLUSPAT - (C) QUESTEL-ORBIT- image  
CPIM (C) Questel-Orbit  
PN - US4823070 A 19890418 [US4823070]  
TI - (A) Switching voltage regulator circuit  
PA - (A) LINEAR TECHN INC (US)  
IN - (A) NELSON CARL T (US)  
AP - US8298987 19870803 [1987US-0082989]  
PR - US8298987 19870803 [1987US-0082989]  
- US93215886 19861118 [1986US-0932158]  
EC - H02M-001/00S  
- H02M-003/335C  
- H02M-003/335C4  
PCL - ORIGINAL (O) : 323285000; CROSS-REFERENCE (X) : 323299000  
DT - Basic  
CT - US4146832; US4209826; US4253137; US4425612; US4641229; US4652808  
- Data sheet, "Switching Dc-to-DC Microconverters--LSH 6300 Series",  
date unknown.

Data sheet, Unitrod UC 1846 Current Mode PWM Controller integrated  
circuit, 12/83.

Documents relating to the Linear Technology Corporation LT-1070  
integrated circuit.

STG - (A) United States patent  
AB - An integrated circuit for use in implementing a switching voltage  
regulator, the integrated circuit including a power switching  
transistor, driver circuitry and control circuitry, which is operable  
in a normal feedback mode or an isolated flyback mode. The integrated  
circuit includes shutdown circuitry for placing the regulator in a  
micro-power sleep mode, and can be packaged in a five-pin conventional  
power transistor package. The terminals of the integrated circuit  
regulator perform multiple functions. A compensation terminal is used  
for frequency compensation, current limiting, soft-start operation and  
shutdown. A feedback terminal is used as a feedback input when the  
integrated circuit is in feedback mode, and as a logic pin to program  
the regulator for isolated flyback operation. The feedback terminal is  
also used to trim the flyback reference voltage.

1/1 LGST - (C) LEGSTAT  
PN - US 4823070 [US4823070]

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US 4,823,070

07/683549

AP - US 82989/87 19870803 [1987US-0082989]  
DT - US-P  
ACT - 19870803 US/AE-A  
APPLICATION DATA (PATENT)  
{US 82989/87 19870803 [1987US-0082989]}  
- 19890418 US/A  
PATENT  
- 19910521 US/RF  
REISSUE APPLICATION FILED  
910410  
- 19960326 US/RF  
REISSUE APPLICATION FILED  
951116  
- 19970812 US/RF  
REISSUE APPLICATION FILED  
961210  
UP - 1997-38

1/1 CRXX - (C) CLAIMS/RRX

AN - 1935445  
PN - 4,823,070 A 19890418 [US4823070]  
PA - LINEAR TECHNOLOGY CORP  
PT - E (Electrical)  
ACT - 19910410 REISSUE REQUESTED  
Issue Date of O.G.: 19910521  
Reissue Request Number: 07/683549  
Examination Group responsible for Reissue process: 212  
  
- 19951116 REISSUE REQUESTED  
Issue Date of O.G.: 19960326  
Reissue Request Number: 08/558024  
Examination Group responsible for Reissue process: 2111  
  
- 19961210 REISSUE REQUESTED  
Issue Date of O.G.: 19970812  
Reissue Request Number: 08/794374  
Examination Group responsible for Reissue process: 2111  
  
UP - 1999-00

1/3 PAST - (C) Thomson Derwent

AN - 199732-001445  
PN - 4823070 A [US4823070]  
DT - A (UTILITY)  
OG - 1997-08-12  
CO - REA  
ACT - REISSUE APPLICATION FILED  
SH - REISSUE APPLICATION FILED

2/3 PAST - (C) Thomson Derwent

AN - 199613-000643  
PN - 4823070 A [US4823070]  
DT - A (UTILITY)  
OG - 1996-03-26  
CO - REA  
ACT - REISSUE APPLICATION FILED  
SH - REISSUE APPLICATION FILED

12/10/02

US 4,823,070

07/683549

3/3 PAST - (C) Thomson Derwent  
AN - 199105-001581  
PN - 4823070 A [US4823070]  
DT - A (UTILITY)  
OG - 1991-05-21  
CO - REA  
ACT - REISSUE APPLICATION FILED  
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Search statement 1

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1 Patent Groups  
\*\* SS 1: Results 1

Search statement 2

?famstate nonstop

1/1 INPADOC - (C) INPADOC  
PN - US 4823070 A 19890418 [US4823070]  
TI - SWITCHING VOLTAGE REGULATOR CIRCUIT  
IN - NELSON CARL T [US]  
PA - LINEAR TECHN INC [US]  
AP - US 82989/87-A 19870803 [1987US-0082989]  
PR - US 932158/86-A1 19861118 [1986US-0932158]  
IC - G05F-001/563

1/1 LEGALI - (C) LEGSTAT  
PN - US 4823070 [US4823070]  
AP - US 82989/87 19870803 [1987US-0082989]  
DT - US-P  
ACTE- 19870803 US/AE-A  
APPLICATION DATA (PATENT)  
{US 82989/87 19870803 [1987US-0082989]}  
- 19890418 US/A  
PATENT  
- 19910521 US/RF  
REISSUE APPLICATION FILED  
910410  
- 19960326 US/RF  
REISSUE APPLICATION FILED  
951116

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US 4,823,070

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- 19970812 US/RF  
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# HOW TO OBTAIN BOTH RESET AND POWER FAIL

Figure 46 shows how it is possible to obtain at the same time both the power fail and reset functions by adding one diode (D) and one resistor (R).

Since the reset delay time (pin 13) can only occur when the output voltage is  $V_o \pm \Delta V_{reg} \pm 100 \text{ mV}$  and the voltage across R2 is higher than 4.5 V.

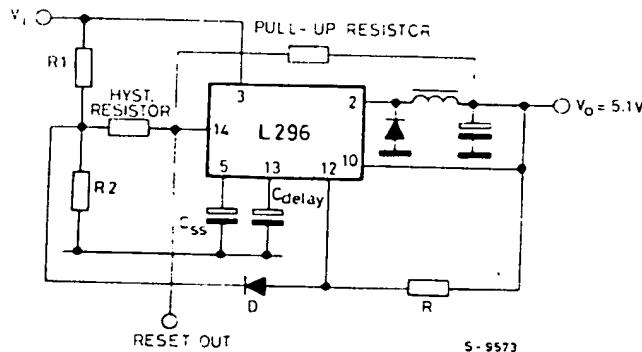
With a hysteresis resistor it is possible to fix the in-

put pin 10 hysteresis in order to increase immunity to the 100 mV ripple present on the supply voltage.

Moreover, the power fail and reset delay time are automatically locked to the soft start. Soft start and delayed reset are thus two sequential functions.

The hysteresis resistor should be in the range of about 100 k $\Omega$  and the pull-up resistor of 1 to 2.2 k $\Omega$ .

Figure 46.



S-9573